

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division		NUMBER IH96400
INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure		REVISION Final Rev5
SUBJECT:	INSTRUMENT OPERATION:	DATE 11/02/05
GenRad 1982 As a Precision Sound-Level Meter		PAGE 1 OF 15

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1.0 Purpose/Scope

This procedure provides a standardized method for the operation of the GenRad GR1982 Precision Sound Level Meter. It should be used in conjunction with the SBMS Subject Area *Noise and Hearing Conservation* and IH SOP IH96200 *Noise Measurement Principles: Area Surveys*.

The GenRad 1982 provides a method for easy and accurate surveys of workplace noise exposures. This area survey meter should be used to determine the baseline noise levels and area noise levels. Its use is designed for conducting noise surveys to determine the need for area warning posting, locate problem-noise sources, and measuring the effectiveness of engineering controls.

The GenRad 1982 can be used as a screening tool to determine the need for personal monitoring and to sketch isometric lines for control area delineation. Generally, employee exposure assessments should be made with a noise dosimeter. However this area survey meter can be used in limited situations for exposure assessments, such as for operations that are of short duration and involve limited employee movement. This allows the meter to measure the actual employee exposure. In these cases, the meter reading must be observed over the entire time of exposure.

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2.0 Responsibilities

- 2.1 Use of the GenRad 1982 is limited to persons who act under the direction of a competent hazard assessment person and have demonstrated the competency to satisfactorily use the meter as evidenced by experience and training to the qualification criteria set by BNL.
- 2.2 Personnel that perform exposure monitoring with this instrument are responsible to follow all steps in this procedure.
- 2.3 The data collected using this meter must have an appropriate evaluation of the hazard and risk by a skilled Industrial Hygiene professional.

3.0 Definitions

- 3.1 *Decibel (dB)*: A non-dimensional unit used to express sound pressure levels. It is the log of the ratio of the measured sound pressure level to a reference level.
dBA: A sound pressure level in decibels made on the A-scale of a sound level meter. This unit of measure approximates the response of the human ear.
dBC: Sound pressure based on a nearly flat, non-weighted scale.
- 3.2 *Frequency*: The number of cycles completed by a periodic quantity in a unit time. Unit, hertz (Hz) measures cycles per second.
- 3.3 *Impulse or Impact Noise Levels*: Variations in noise levels that involve peak levels spaced at periods of greater than one per second. Where the intervals are less than one second, it should be considered a continuous noise source.
- 3.4 *Occupational Exposure Limit*: The maximum time weighted average (TWA) exposure permitted for employee exposure, based on the less of the OSHA Permissible Exposure Limits (PEL) or ACGIH Threshold Limit Value (TLV). See IH96200.

4.0 Prerequisites

4.1 **Training prior to using this meter:**

- 4.1.1 Demonstration of proper operation of the instrument to the satisfaction of the employee's supervision. Refer to Section 7 *Implementation and Training*.
- 4.1.2 Other appropriate training for other hazards in the area to be entered may be needed. Check with ESH coordinator or FS Representative for the facility.

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4.2 Area Access:

- 4.2.1 Contact the appropriate Facility Support Representative or Technician to obtain approval to enter radiological areas.
- 4.2.2 Verify with the appropriate Facility Support Representative or Technician if a Work Permit or Radiological Work Permit is needed or is in effect. If so, review and sign the permit.
- 4.2.3 Use appropriate PPE for area

5.0 Precautions

5.1 Hazard Determination:

- 5.1.1 The operation of this meter does not cause exposure to any chemical, physical, or radiological hazards. The meter design does not cause significant ergonomic concerns in routine use. The meter does not generate Hazardous Waste.
- 5.1.2 By its very nature, the GenRad meter may be used in areas where excessive noise levels exist or are suspected to be present. Exposures to noise levels above the PEL and/or TLV may cause temporary or permanent hearing loss.

5.2 Personal Protective Equipment:

- 5.2.1 In areas where noise levels exceed the *Occupational Exposure Limit (OEL)*, hearing protection should be worn. The hearing protection should be able to reduce the noise levels below the OEL. See IH96200 for guidance on PPE selection.
- 5.2.2 Additional PPE: Other appropriate PPE for the area being entered. Check with your FS Representative.

6.0 Procedure

Equipment: (Pictured in Appendix 9.1)

- Meter Body
- Microphone

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- Battery Pack
- Battery Charger
- Wrist Strap
- Calibration screwdriver
- Sub-miniature phone plug
- 10-foot microphone extension cable
- Calibrator

Operation of the GenRad (picture of meter and description of controls and displays is contained in Appendix 9.1.)

6.1 Battery Check

- 6.1.1 Slide the Power switch to the **BAT** and hold it there briefly.
- 6.1.2 Verify that the meter pointer indicates in the **BAT ok** areas and that the digital display indicates **888.8**. If it does not, recharge battery.
- 6.1.3 Perform the battery check at least once every half hour of use.

6.2 Warm-up: A warm-up is not required for this meter.

6.3 Calibration:

- 6.3.1 Verify that the calibrator battery checks ok.
- 6.3.2 Slide the *Power Switch* to **ON** and the *DIGITAL DISPLAY* switch to **CONT**.
- 6.3.3 Set the *Octave Filter* switch to **WTG**, the *WEIGHTING* switch to **A**, and the *Detector* switch to **Slow**. Select the **70 to 120 dB** range.
- 6.3.4 Turn the calibrator on and select 1000 Hz (1kHz).
- 6.3.5 Place the calibrator, with ½ inch coupler/adaptor installed, over the microphone of the sound level meter (SLM).
- 6.3.6 Observe that both the SLM pointer and the digital display indicate **114** (plus or minus 0.5 dB). If the indication is outside this range, adjust the **CAL** control.

6.4 Operation:

- 6.4.1 Select the desired weighting by sliding the *WEIGHTING* switch to **A, B, C** or **FLAT**. The *OCTAVE FILTER* switch must be in the **WTG** position.
- 6.4.2 Select desired detector characteristic by sliding the *DETECTOR* switch to **FAST, IMP, PEAK**, or **SLOW**. The detector can be reset in either the **IMP** or **PEAK** modes by depressing the *CAPTURE* button momentarily.
- 6.4.3 Adjust the *dB RANGE* switch for an on-scale meter indication and read the

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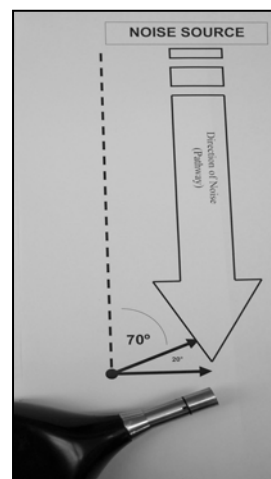
meter or digital display. If the *OVERLOAD* lamp is lit, adjust the *dB RANGE* switch to a higher range.

6.5 Digital Display:

- 6.5.1 For a display that duplicates the meter indication, set the *DIGITAL DISPLAY* switch to **CONT**. The display will now track the meter indication.
- 6.5.2 To capture a measurement, slide the *DIGITAL DISPLAY* switch to **CONT** and at the desired moment, press and hold the **CAPTURE** button. The digital display will be “frozen” as long as the **CAPTURE** button is held.
- 6.5.3 To capture the maximum indication during a measurement period, slide the *DIGITAL DISPLAY* switch to **MAX**. Press the **CAPTURE** button and release it to begin the measurement period.

6.6 **Operator Position:** Preferably the operator should be further from the sound source than the microphone and positioned as to reduce reflection of the sound to the meter. Hold the meter at arms length.

- DO NOT stand between the sound source and microphone.
- DO NOT place the hand within 12 cm (5 inches) of the microphone.
- The microphone is a “flat-random-incidence-response type”.
Do not point the meter at the source, hold it at a 70-90 degree angle, i.e., take the measurement so that the path from the noise source to the microphone is along a 70° to 90°.)
- Take measurements at ear level of employee (sitting, standing or bending) to estimate personal exposures and to locate isometric lines of noise intensity on a sketch for defining area levels.



6.7 Recording readings:

- 6.7.1 Use the BNL Area Survey Form (Attachment 9.4) to record readings (see the IH web page for the most recent version).
- 6.7.2 Return meter and original sampling form to the SHSD IH Laboratory daily or at the end of each project as agreed to by the IH Laboratory Technician.
- 6.7.3 Send a copy of any hazard evaluation report written on the survey to the IH Laboratory and the Occupational Medicine Clinic.

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6.7.4 Post-calibrate (i.e. single point operational accuracy check) the meter as per the Instrument Operation SOP.

7.0 Implementation and Training

- 7.1 Training prior to using this meter includes a demonstration of proper operation of the instrument based on training, education, and experience. All persons must have met the qualification criteria for IH96 Noise Assessor set in IH50300 BNL IH Program and IH Group Training & Qualification Matrix.
- 7.2 Personnel are to document their training using the Attachment 9.5, the Job Performance Measure Completion Certificate for this meter. Qualification on this JPM is required on a 3 year basis, providing the professional is monitoring noise sources frequently.
- 7.3 A baseline audiogram may be needed if the duration of exposure to the person performing the survey will be in excess of the OSHA Permissible Exposure Limits (PEL) or ACGIH Threshold Limit Value (TLV) (which ever is less). See IH96200.
- 7.4 Other appropriate training for the area to be entered (check with ESH coordinator or FS Representative for the facility).

8.0 References

- 8.1 GenRad GR 1982 Precision Sound-Level Meter and Analyzer Instruction Manual.
- 8.2 BNL SBMS Subject Area *Noise and Hearing Conservation*.
- 8.3 OSHA Noise/Hearing Conservation 29CFR1910.95.
- 8.4 NIOSH Criteria for a Recommended Standard-Occupational Noise Exposure, 1998.
- 8.5 ACGIH American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

9.0 Attachments

The only official copy is on-line at the SHSD IH Group website.
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- 9.1 Photo of meter and parts
- 9.2 Theory of Operation
- 9.3 Short List of Operating Instructions
- 9.4 Area Survey Form
- 9.5 *Job Performance Measure Completion Certificate*

10.0 Documentation

Document Development and Revision Control Tracking		
PREPARED BY: <i>(Signature and date on file)</i> C. Kramer Author Date 02/16/01	REVIEWED BY: <i>(Signature and date on file)</i> J. Peters SHSD IH Group Date 02/20/01	APPROVED BY: <i>(Signature and date on file)</i> R. Selvey SHSD IH Group Leader Date 02/22/01
ESH Coordinator/ Date: <i>none</i>	Work Coordinator/ Date: <i>none</i>	SHSD Manager / Date <i>none</i>
QA Representative / Date: <i>none</i>	Training Coordinator / Date: <i>none</i>	Filing Code: IH52
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ISM Review - Hazard Categorization <input type="checkbox"/> High <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Low/Skill of the craft	Validation: <input type="checkbox"/> Formal Walkthrough <input type="checkbox"/> Desk Top Review <input type="checkbox"/> SME Review Name / Date:	Implementation: Training Completed: Tracked in BTMS Procedure posted on Web: 11/02/05 Hard Copy files updated: 11/02/05

Revision Log		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Renumbered from IH-FP-107 to new system IH96400. Added SURVEY FORM and made minor format changes.		
<i>(signature on file)</i> R. Selvey 03/09/01 SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:

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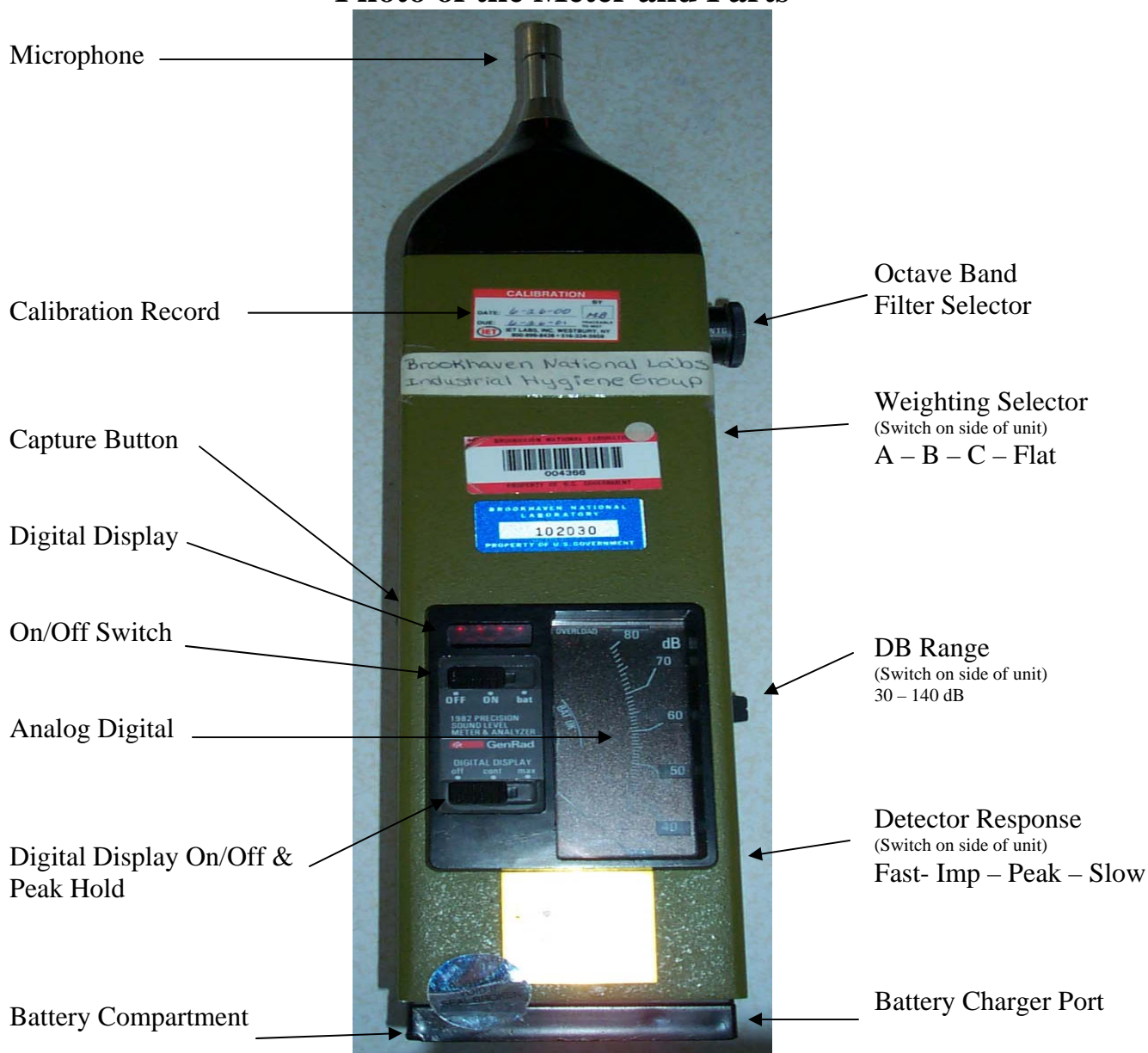
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(signature on file) R. Selvey 04/20/01 SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Corrected calibration clerical error in step 6.2.1.3.6 from 5 dB to 0.5 dB.		
(signature on file) R. Selvey 04/27/01 SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Clarified wording on pre and post calibration to reinforce policy in IH51660.		
(signature on file) R. Selvey 06/08/01 SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input checked="" type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Revised format with Section 7 as Implementation and Training. Updated references to SBMS. Updated reference to JPM in IH96120.		
(signature on file) R. Selvey 04/12/04 SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Added Attachment 9.5. Change in Section 7.		
(signature on file) R. Selvey 07/12/04 SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Revised Section 7 training requirements. Updated Section 10 to new format.		
(signature on file) R. Selvey 11/02/05 SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:

Attachment 9.1

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Photo of the Meter and Parts



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Attachment 9.2

Theory of Operation

The GenRad GR 1982 is a precision sound level meter which incorporates octave-band filters from 31.5 Hz to 16 kHz, A, B, C and Flat weighting networks, as well as FAST, SLOW, IMPACT and IMPULSE detector response. The sound pressure is displayed on a 50-dB linear scale. The meter utilizes a 4-digit display that follows the analog meter indication with a 0.1 dB resolution.

- A reading can be captured on the digital display at the precise instant required while the analog meter continues to track the incoming noise level
- The digital display can be used in the continuous mode or it can be operated to capture and hold the maximum level encountered. This is extremely useful when measuring sounds of short duration or vehicle “passerby” sounds.
- In the maximum mode, the digital display will be updated by the highest sound level. The display can be reset by pressing a button.
- In the peak (impact) or impulse modes, the peak detector can be reset by the press of a button. This allows other readings to be taken without waiting for the peak detector to decay.

Weighting Networks. The meter contains three weighting networks, A, B, C, which shape the noise to discriminate against the frequency components of the measured noise.

- *A Network*: Simulates subjective responses to noise. Generally used in noise surveys to locate noise hazards. The A Network discriminates the low frequencies quite severely. Most regulations require that noise be measured on the A-weighting scale.
- *B Network*: Moderately discriminates (filters) against low frequencies
- *C Network*: Barely discriminates (filters) against low frequencies.

If measured sound levels of noise are much higher on the C-weighting than on the A-weighting, much of the noise is contributed by the low frequencies.

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Attachment 9.3

Short Operating Instructions

	Step	User Action	Digital Display
1	Battery Check	Slide power switch to battery – hold briefly. Pointer should indicate <i>BAT ok</i>	888.8
2	Calibration	Power switch ON Octave Filter switch – WTG Weighting Switch to A Detector Switch to SLOW Turn Calibrator on and place over microphone of meter (using installed ½ inch coupler/adaptor), set meter at 1 kHz	<i>CONT</i> Select 70-120 dB range: meter reading of <i>114</i> (plus or minus 5 dB) is acceptable.
3	Operation	Slide Weighting Switch to A, B, C or FLAT Slide Detector Switch to FAST, IMP, PEAK or Slow Adjust dB range	
4	Capturing Measurement	Slide Digital Display Switch to CONT and press CAPTURE button. To capture maximum dB level during measurement, slide Digital Display Switch to MAX and Press CAPTURE button.	
5	Operator Position	Stand at the same distance from sound source as the microphone. Hold Meter at arms length.	

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Attachment 9.4
Sound Pressure Level Meter
Area Survey Form
(form is two sided)
(next 2 pages)

Attachment 9.5
Job Performance Measure
(one page)
(follows Attachment 9.4)

BROOKHAVEN NATIONAL LABORATORY <small>ENVIRONMENTAL Safety Health and Qualification Directorate</small>		SOUND PRESSURE LEVEL SURVEY NOISE MEASUREMENT FORM
DATE:	SURVEYOR(S):	

I. AREA INFORMATION		
DEPT:	BLDG:	ROOM:
SOURCE:		
ENGINEERING CONTROLS:		

II. EMPLOYEE INFORMATION		
FIRST NAME:	LAST NAME:	BNL #:
DEPT:	BLDG:	JOB TITLE:
EXPOSURE DURATION (HRS):	EXPOSURE (TIMES PER DAY):	EXPOSURE (DAYS PER YR):
JOB PERFORMED:		
PPE USED:		

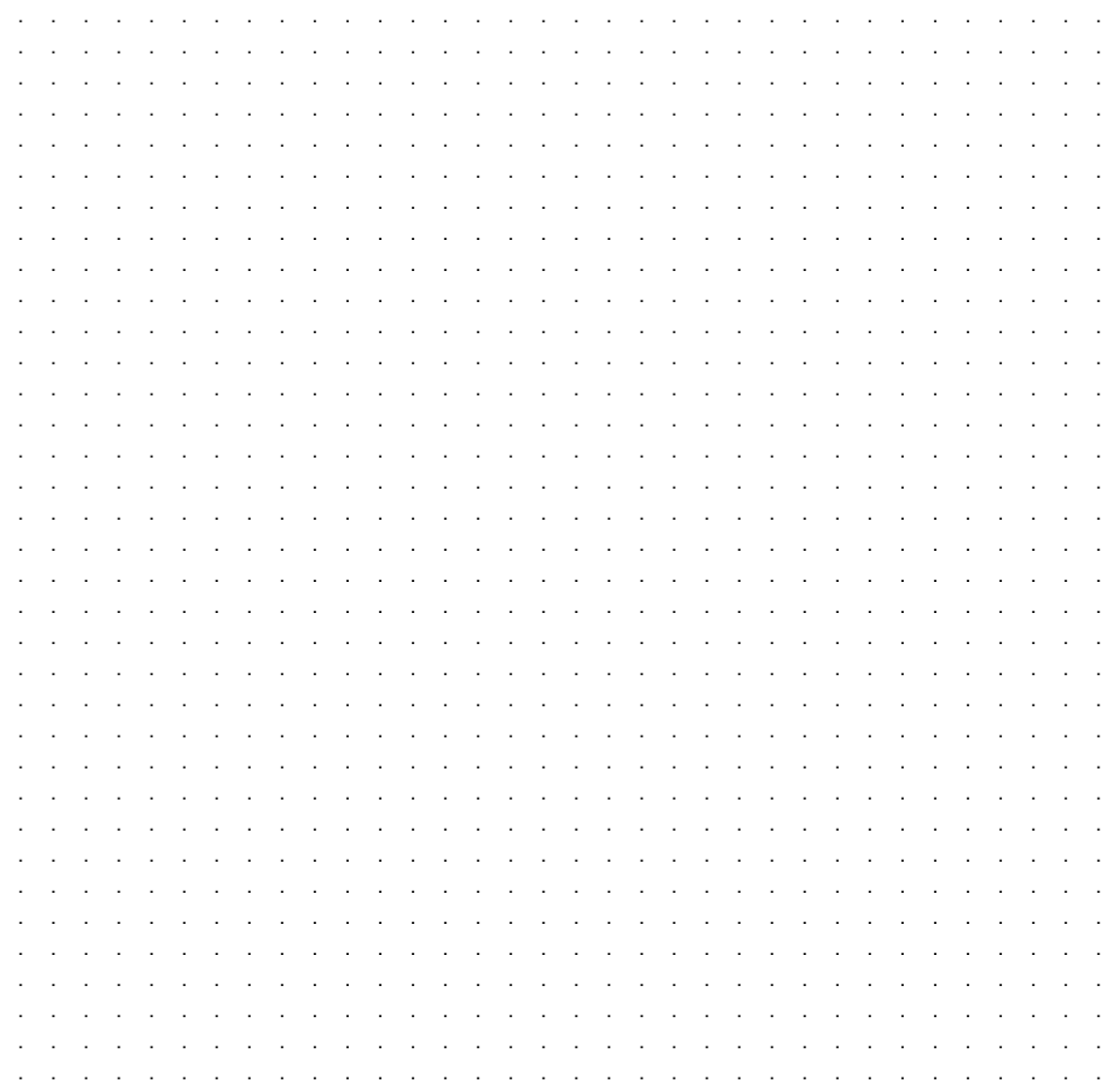
III. SURVEY INSTRUMENT INFORMATION												
INSTRUMENT:	MODEL:						SERIAL#:					
FACTORY CALIBRATION DATE:	PRE-CAL: BY:						POST CAL: BY:					
BATTERY CHECK (Y/N):	125 250 500 1000 2000						125 250 500 1000 2000					
CALIBRATOR SERIAL #:	dBA						dBA					
	dBC						dBC					

IV. SAMPLING INFORMATION & RESULTS					
Response: <input type="checkbox"/> FAST <input type="checkbox"/> SLOW WIND SCREEN: Y N					
TIME	LOCATION OF SAMPLE READING	SPL READING		COMMENTS, SPECIAL CONDITIONS, and/or STATUS OF SOURCE	
		dBA	dBC		
<input type="checkbox"/> Additional Data on back of form					

V. CONCLUSIONS & RECOMMENDATIONS	
Return completed form to: SHSD IH Lab	
FILE CODE: IH96SR. FORM IH96 Area Survey (03/01)	

[illegible]

SKETCH OF SAMPLING AREA (OPTIONAL)

A large grid of dots for sketching a sampling area. The grid consists of 20 columns and 20 rows of small, evenly spaced dots, providing a template for drawing a sampling area.

Noise and Hearing Conservation Operation of the GenRad 1982 as SPL Meter



Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:
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Practical Skill Evaluation: Demonstration of Evaluation Methodology by Oral Exam

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Hazard Analysis	Understands the need to perform a hazard analysis of the area and potential exposure to the self as sampler and workers in the area.			
2. Personal Protective Equipment	Understands the need to be aware of the potential surface contamination, airborne levels of contaminants, radiological hazards, and noise hazard. Knows how to determine the need for PPE.			
3. Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.			
6. Operating Parameters	Knows the theory to establish operating parameters (safety envelope) for the equipment.			
7. Documentation	Demonstrates correctly filling out IH monitoring forms.			

IH Noise Meter Operation - Practical Skill Evaluation: Demonstration of Methodology

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Turning the Meter On and Off	Demonstrates correctly activating the meter and turning it off			
2. Calibration of the Meter	Demonstrates correctly calibrating/bump checking the meter			
3. Clearing Stored data	Demonstrates the correctly to erase stored data			
4. Operation of taking a reading	Demonstrates correctly hold the meter, and the correct settings			
5. Downloading stored data	Demonstrates correctly extracting stored data from the meter to paper printout and electronic storage.			
6. Clearing data after downloading	Demonstrates correctly for removing stored data for the next user.			

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:
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I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date:
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